Remarks

Claims 12, 18, and 19 were rejected as anticipated by U.S. Patent No. 5,973,785 (Okamoto). These rejections are respectfully traversed. Okamoto describes the use of modes of opposing phases to restrict the lateral extent of a spot focused at a surface. This shaping of the lateral extent affects the resolution of an optical system with a threshold response; an attribute important to Okamoto's intended application of optical patterning using photoresist lithography and laser assisted CDV. As described in Okamoto, the use of phase shift masks does not increase the cut-off spatial frequency of the modulation transfer function of an optical system with a non-threshold or linear response; it is well known that the phase mask merely redistributes the modulation function, increasing the response for certain spatial frequencies at the expense of other bands of spatial frequencies. When combined with a nonlinear response detector, spatial reduction of a recorded feature can occur by the use of Okamoto's phase mask.

On page 5, lines 9-11, of the Office Action dated April 22, 2003, the Examiner contends that modes overlap behind the specimen in Okamoto "in so far as a sample has differing heights and 'behind said section' is interpreted as level different from the plane of focus (section) of the specimen in the direction of the illuminating beam." Okamoto teaches two classes of systems. In one class, modes are formed which when overlapped at the image plane have a central structure smaller than that due to one mode alone. The second class of systems involves using a beam with modes of opposite phase to locate the surface of sample with an asserted high degree of accuracy. This second class of systems is intended to improve the placement of a substrate prior to lithographic exposure.

Okamoto's consistently asserts the reduction of lateral size of beam of light at focus. Attempting to collect an image from a sample not within the depth of focus is counter to the attempt to improve resolution. Resolution is always worse away from the focal plane. If it were not, one would simple focus the system to this plane.

The structures that Okamoto describes are surfaces or isolated defects. The system does not image composite objects with thicknesses greater than the depth of focus, nor where there may be an abundance of scatters, both ahead and behind the section in the direction of propagation.

The operation of Okamoto's confocal microscope is distinguishable from the present invention. This is apparent in FIG. 20 of Okamoto where the phase shifter 4 is present in both the illumination and detection path of the optical system. That is light from the optical source passes through phase shifter 4 where "light fluxes L_1 and L_2 that have opposite phases relative to one another" are focused onto the sample, as described at column 16, lines 12-14. (Phase shifter 4 shapes the phase distribution of the illumination in light fluxes L_1 and L_2 to the sample surface 2 as diagramed in FIG. 1). Because L_1 and L_2 have opposite phases, it is obvious that L_1 is retarded by 180° relative to L_2. This is further substantiated by the equation described in Okamoto at column 9 at about line 30. Light reflected from a surface in Okamoto is collected by the objective lens 5 and then passes through the phase shifter 4 prior to reaching the detector (see FIG. 20). When the reflected return light from the sample passes through the phase shifter 4, the reflected return light picks up 180° more phase retardation for a total of 360° before being directed to the detector. As a result, before striking the detector light returned from the sample is in phase across the beam. Said another way, areas of the sample illuminated by out of phase light (mode from L_1) are further phase delayed until they are in phase with areas illuminated by the opposite phase (L_2) by the time the light returned from the sample reaches the detector. Compare this to the modes pattern of the present invention in which the modes have 180° phase difference prior to the beamsplitter (Figs. 1 and 4), and thus, illuminate the object and impinge on the detector carrying 180° phase difference. It is submitted that in Okamoto the presence of the phase shifter 4 in the return path cancels its affect prior to directing the returned light to the detector, and hence, Okamoto cannot be said to provide interference of light returned from sites (scatters) adjacent to the section being imaged, or image returned light in which the part of returned light from the sites adjacent the section, i.e., at one of behind, ahead, or behind and ahead of the section, is reduced. Thus, Okamoto cannot provide the advantageous the image enhancement provided by the claimed invention.

Claim 12, as amended, describes a scanning microscope in which part of the return light from sites adjacent the section at one of behind, ahead, or behind and ahead of the section is reduced. This is not new matter requiring additional Examiner search as similar language is already present in Claim 19. Further, Applicant has reinserted

language of the Claim 12 previously deleted to describe the overlap of spots at one of behind, ahead, or behind and ahead of section, which was the subject of a previous Examiner search. For reasons argued above, even if Okamoto had modes capable of overlapping behind the specimen, as the Examiner contends, Okamoto by having its phase shifter 4 in the return light path cannot provide any part of the return light from sites adjacent the imaged surface which could overlap at one of behind, ahead, or behind and ahead of section to reduce light. Clearly, this overlap condition cannot exist in the return light of Okamoto as a result of the return light being placed "in phase" by phase shifter 4 prior to reaching its detector. This is due to the physic of light in the Okamoto system. Accordingly, Claim 12 is not anticipated by Okamoto.

Claim 18 has been amended to describe means for detecting return light combined from plural spots to provide images representing the section of the tissue in which modes overlap to reduce the part of the return light from sites adjacent the section at one of behind, ahead, or behind and ahead of the section. Again, this is not new matter requiring additional Examiner search as similar language is already present in Claim 19. Further, Applicant has reinserted language in Claim 18 previously deleted to describe overlap of modes at one of behind, ahead, or behind and ahead of the section, which was the subject of a previous Examiner search. Thus, for reasons argued above, Claim 18 is not anticipated by Okamoto.

Claim 19 describes beams as overlapping in a medium outside the imaged section to reduce the part of returned light from the sites adjacent the section on opposite sides of the section in the direction of propagation of the beams. For reasons argued above, Claim 19 is not anticipated by Okamoto, since phase shifter 4 being in both the illuminating and return light paths would not reduce the part of returned light from the sites adjacent the section on opposite sides of the section in the direction of propagation of the beams.

Claim 13 was rejected as being unpatentable over Okamoto in view of Official Notice. Claim 13 depends on Claim 12,which for reasons argued above, is not described or suggested by Okamoto. Thus, Applicant requests that the rejection of Claim 13 be withdrawn.

Claims 14-17 were rejected as being unpatentable in view of Okamoto and U.S. Patent No. 5,760,901 (Hill). Claim 14 describes a detection arm into which light is directed by a beam splitter from reference and sample arms, and means for providing images in response to interference of light in said detection arm. The interference of light in the detection arm is not described or suggested in Okamoto where the return light onto its detector is made "in phase" by the phase shifter 4 prior to reaching the detector. Hill does not provide that which is absent in Okamoto, and thus the combination of Hill and Okamoto does not provide the claimed invention. Therefore, withdrawal of the rejection of Claim 14 and of its dependent Claims 15-17 is requested.

It is believed the Application is in condition for allowance. A petition for a three-month extension of time is enclosed.

Respectfully submitted,

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